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THE JOURNAL OF PHILOSOPHY

RELATIVITY AND THE LAY MIND. II[1]

5. SPACE-TIME

The conception of space-time is discussed by Professor Eddington under the title "The world of four dimensions."

When we speak of a "dimension" we are using a word with which few laymen connect any clear and distinct idea. Yet the term is not the fruit of special studies, like the terms "geodesic" or "field of force," which only an adept may criticize. It is a term in common use, upon which any layman may, without presumption, examine himself. Perhaps the best a layman could do at first in the way of a paraphrase, would be to say that a dimension is something that everybody knows space has three of, and time only one of. If pressed, he might say that the three dimensions of space are such things as right-and-left, back-and-forth and up-and-down; and the one dimension of time is sooner-and-later. This brings the idea a little closer. Evidently, when we speak of a dimension, we have in mind a group of things in an order fixed by a single certain relation. In thinking of the dextral and sinistral dimension of space, we have in mind a group of points each in the relation right (or left) from each of the others, and right (or left) of all that any other point to which the first is right (or left) is also right (or left) of. When we think of space, we also bring in a relation of advance or retreat, and are thinking of each of the right-and-left points as also a member of a back-and-forth group of which the same as the above can be said; and of each member of these back-and-forth groups as also forming with other points of such groups a right-and-left group of the same kind. The same thing happens when we think of the points of space as having also an up-and-down relation. Each point of the enlarged group formed of right-and-left points and back-and forth points is a member also of a group having the up-and-down dimension in the sense already defined, the reciprocal relations mentioned holding for all three of the different classes of points.

In theory, we could go on indefinitely by successively enlarging the groups reached in the way supposed, using other relations for the purpose; that is to say, adding more dimensions to the total

[1] Continued from preceding issue, No. 18.

formed. But in the instance of space we have run out of relations. There are no other relations between points than such as these three. There remains time, with its single new relation of sooner-and-later, between elements termed instants. Can we not form a larger than the triple group by adding instants to points, time to space? We can, by changing our notion of the elements of the four-dimensional group resulting. A point in space has no temporal quality, but we can make our four-dimensional group by taking, instead of the point itself, something happening at that point at a certain instant. This is what we call an "event" at that point and instant; or, as we may say with Professor Eddington, a "point-event." Evidently, in so doing we have gathered the whole physical world into a four-dimensional order; for the whole physical world consists of events happening at one point or another of space and at one instant or another of time. All external nature comes thus to form in our thoughts a world of four dimensions—three spatial and one temporal.

The conception of external nature as uniting space and time into a four-dimensional world is the conception called in expositions of relativity "Space-Time."

It is true that the term "space-time" appears to mean more in the doctrine of relativity than the undeniable fact that the whole physical world consists of events happening at one point or another of space, and one instant or another of time. It appears to mean also that time has no existence at all apart from space; in a word, that what alone exists is a blending of time with space, this blending being called "space-time." Such a conception is not a physical, but a philosophical doctrine, and in the minds of most laymen would unquestionably meet with a simple denial. To them, time does exist apart from space. While everything that any one sees happen, happens in time, some things have no spatial quality at all, do not happen in any spatial "where," but simply to him. Such are events of the inner world, so called in distinction from the physical, or outer world. In these inner events time exists apart from space; and, accordingly, in so far as time exists in connection with space, or in the events of the physical world, there is not a blending but a linkage of the two. In order not to enter the field of philosophical dispute, the further discussion here of "space-time" will be restricted to the notion in which all are agreed; namely, that all the events with which physics has to do make up together a world of four dimensions, three spatial and one temporal.

In the attempt to combine the one temporal dimension with the three spatial dimensions in a "space-time" a possible difference of procedure emerges. When we add our back-and-forth groups of points to our right-and-left group, each member of the right-and-left

group becomes a member of a back-and-forth group distinct from every other; likewise when we add up-and-down groups to the enlarged group of right-and-left and back-and-forth points.

But when we turn our points into point-events and consider each of the new type of element as a member also of a group of sooner-and-later instants, shall we consider the group of sooner-and-later instants to which any given point-event belongs as distinct from the group to which an event at any other point belongs, as we have done for space? Or, shall the groups of sooner-and-later instants to which events at different points belong partly or wholly coincide? This would be to adopt a new procedure. Shall the groups of instants to which events at different points belong be wholly distinct (alternative α), partly consist of the same instants (alternative β), or form together one and the same group (alternative γ).

Thus it appears that there are three ways in which "space-time" may be conceived. The time-dimension may be added either in the way one spatial dimension is added to another, or by departing partly or wholly from that analogy. Space-time may be *symmetrical* (α), *symmetroidal* (β), or *a-symmetrical* (γ) in constitution. These are the three possible and mutually exclusive alternatives.

The a-symmetrical alternative γ represents the view of time hitherto universal. There is but one absolute order of instants. To any point-event corresponds an event occurring at every other point at the same instant.

Relativity relinquishes this immemorial idea. Its conception of space-time joins the time-dimension to the three spatial dimensions, not in the unique way conceived by the believers in absolute time, but in a way in a measure resembling that in which one spatial dimension is added to another.

What this measure is appears in the discussion by both Professor Eddington and Mr. Russell of the cases in which two point-events are successive to one another at lapses of time greater or less than that required by a ray of light in traversing the distance between them (*S. T. & G.*, pp. 49 f; *A. B. C.*, pp. 53 f, 61 f).

If the lapse is greater, the succession is fixed for all observers in possible communication, because any observer could receive news —by light signal or wireless message—of the occurrence of one before he observed the other. Professor Eddington writes: "To have actual evidence of the occurrence of one event before experiencing the other is a clear proof of their absolute order in time, which should convince not merely the observer concerned, but any other observer with whom he can communicate."

If the lapse is less, while the succession of the point-events is fixed for the observer concerned (p. 50), it is not necessarily fixed like-

wise for any other because—light being the swiftest messenger in the world—he could not receive and communicate any such evidence. "The order of the two events can therefore only be inferred by estimating the delay of the message, and this estimate will depend on the observer's mode of reckoning space and time."

The space-time of relativity is thus divided into three zones: "The indubitable past," "the indubitable future," and a zone in which events "are (absolutely) neither past nor future, but simply 'elsewhere.'"

Mr. Russell writes: "Suppose an event *E* occurs to me and simultaneously a flash of light goes out from me in all directions. Anything that happens to anybody after the light from the flash has reached it, is definitely after the event *E* by any system of reckoning time. Any event anywhere which I could have seen before the event *E* occurred to me is definitely before the event *E* in any system of reckoning time. But any event which happened in the intervening time is not definitely either before or after *E*."

The layman who writes is obliged to confess that this argument presents to him insuperable difficulties. It might be paraphrased as follows:

Any observer whom news of a distant event reaches before, or at the instant when, something happens to him, will judge that since the news took time to reach him, the distant event occurred before his receipt of the news; and if that occurred before something happened to him, will further argue, from the nature of the relation of succession, that the distant event occurred before his observation of that something. Any other observer who believed his report of the time-order of the news and the observation would agree with him. Hence the time-order of two events separated in space would be judged alike by all observers in communication, whenever an observer of one could report that news of the other reached him with or before his observation.

On the other hand, any observer whom news of a distant event reached after something happened to him would be obliged to form his judgment of the time-order of the two events upon a different basis. The judgment would no longer involve the fact only that the news took time to reach him, which no one would dispute, but the amount of time it took to come; and on relativistic principles the amount of time between two given point-events may vary from observer to observer. According as the amount of time taken by the news—or the *delay of the message*—were equal to, or longer or shorter than, the amount of time between the observation and the subsequent news, different observers might judge that the event announced occurred simultaneously with or before or after, the event

observed. Only one circumstance could put an end to this discord. Should an observer of an event *B* announced to another observer after something, *A*, happened to that other, report that news of *A* reached him with or before his observation of *B*, he would judge that *A* happened before *B;* and all other observers who believed him would agree with him. If any of them, including the observer of *A*, had before reached any different judgment, he would be obliged to relinquish it.

There are thus two cases. In one case, an observer of one or other of two events separated in space, could report that news of the other reached him with or before his observation. In this case, all observers would agree that that one of the two occurred first. In the second case, the observer of neither event could report that news of the other reached him with or before his observation. In that case, the judgments of different observers might differ and without the possibility of reconciliation. Each of them would know only that the event announced preceded the news of it. As to how much, and hence as to the time-order of the two events, they might always differ.

A doubt arises. Perhaps the judgments of observers about events are all there is to the events. On this supposition, one conclusion just reached—that under certain conditions the judgments of all observers about the time-order of distant events will be alike—asserts that under these conditions their time-order is one, or absolute; and the second conclusion—that under certain other conditions, the judgments of different observers about the time-order of events might be different—asserts that under these other conditions their time-order is many, or relative. But this can not be the implication of the relativistic argument. According to Professor Eddington (*S. T. & G.*, preface) the achievement of relativity has consisted, not in identifying the judgments of observers about events with the events judged, but "in separating far more completely than hitherto the share of the observer and the share of external nature in the things we see happen." Mr. Russell writes to the same effect (*A. B. C.*, p. 25). "Physics is intended to give information about what really occurs in the physical world, and not only about the private perceptions of separate observers. Physics must therefore be concerned with those features which a physical process has in common for all observers, since such features alone can be regarded as belonging to the physical occurrence itself." Thus, according to the fundamental belief of physics, unanimity among observers as to the time-order of distant events is not that time-order itself, but shows what that time-order is in external nature.

The logic of the matter appears as follows:

If the judgments of observers regarding the time-order of two events distant in external nature agree, we have the logical right to believe that the events exist in this time-order in external nature, since there is nothing in the evidence to indicate that they do not. On the other hand, if the judgments of observers differ we have no logical right to believe that the two events exist in any one of the different forms of time-order in external nature, since there is nothing in the evidence to indicate which. In this case, their time-order may exist in external nature in any one of the different forms, or not in any of them—that is to say, it may not exist in external nature at all. Here the alternatives do not stand on the identical level, the latter being the more extreme supposition. Some further evidence is thus needed to justify the mind in accepting it, and rejecting the alternative nearer at hand.

Relativity accepts the extreme alternative. Its conclusions are, first, the logically justified one that in the instance of unanimous judgments by all observers in communication regarding the time-order of events distant in external nature, their time-order belongs to the share of external nature in the things we see happen; and, second, the logically yet-to-be-justified one that in the instance of permanently diverse judgments, the time-order of the events concerned belongs to the share of the observer.

The further evidence needed to justify the choice of this alternative is found by relativity in the principle that while all news takes time to come, there is a kind that takes the shortest possible time. This swiftest of messengers is at present believed to be light. The argument runs: suppose the observers of two events distant in external nature to receive their news, each of the other, by light signal: suppose, further, that nevertheless each observer receives his signal after his observation. Any difference in the judgments of the two regarding the time-order of the events would be incapable of reconciliation. What circumstances in external nature would make it impossible for either to receive his news with or before his observation? Either the two events would be simultaneous in external nature, or one would follow the other in a shorter lapse than light took to carry the news between them. Hence, the time-order of the events would belong to the share of the observers in the things they saw happen, and not be attributable to the share of external nature.

This argument appears to the layman who writes a logical curiosity. It may be shortly stated as follows: Given events succeeding one another in external nature at a larger lapse than light takes to cover the separation in space between them, they have a temporal relation in external nature which is disclosed by the unanimous

judgment of observers regarding it; and on the other hand, Given events at no lapse in external nature or succeeding one another therein at a smaller lapse than light takes to cover the separation in space between them, they have no temporal relation in external nature, this fact being disclosed by the irreconcilable diversity between the judgments of observers regarding such a relation. Otherwise expressed, events are assumed in external nature at two types of temporal relation; and the conclusion is drawn that in the one type they are in temporal relation in external nature, and in the other type they have therein no temporal relation at all. Or, Given two contrasted states of affairs existing in external nature, it follows that one exists in external nature and the other does not.

This argument is hardly reasoning, but rather a combination of a *petitio principii* with a contradiction. Yet from these two propositions results relativistic space-time with its triple division into an absolute past, an absolute future, and a zone intermediate in time, in which events are (absolutely) neither past, present, nor future, from one another, but simply "elsewhere."

What is the rational interpretation of this logical void? It is not that the time-order of distant events in external nature is nonexistent in the intermediate zone of relativistic space-time, and comes into existence in the outlying zones; but that it is hidden in the intermediate zone from the only two observers otherwise in a position to determine it regarding any two events for themselves and others; and manifest in the outlying zones to one of the same two observers.

The layman who wishes to accept the two relativistic principles regarding light and distance appears to have no other choice than to draw the alternative inference first above mentioned, and conclude that while all events have their time-order in external nature, whenever the observation of each of two events separated in space precedes a light-signal from the other, it is permanently impossible for any observer to determine what that time-order is. Under these circumstances it may be misread by any. The layman who writes is compelled so to decide, for to him absolute time is the background of the relativistic argument as of its internally contradictory issue in a space-time divided between time absolute and time relative.

In a more popular presentation of the relativistic conception of space-time, Professor Eddington writes regarding simultaneity as follows, (*Romanes Lecture,* p. 17): "When I say that I am conscious of an instant NOW, I am only conscious of it in so far as it is HERE, inside me. What then has led me to imagine that there exists a continuation of it outside me?" Professor Eddington concludes that our instants are "made to extend through space" . . .

"by an artificial process of computation" and not by "immediate intuition."

This sketch of a cosmological argument against absolute simultaneity is no more convincing to the layman who writes than the previous formal reasoning—or unreasoning. What does the word "HERE" mean? It means an indefinite part of space centered in my physical frame. What does the word "NOW" mean? It means the world as I see it at this instant. NOW is not included in HERE. NOW includes HERE and elsewhere, together with that which is neither here nor elsewhere, that is to say, does not possess the spatial quality at all. There is no question of "extending" NOW from HERE to elsewhere by any "process of artificial computation." NOW covers both—and more—by "immediate intuition."

Thus there is a cosmological reason which may compel a layman to affirm the universal or absolute simultaneity which relativity denies. Notwithstanding the symmetroidal teaching of relativity, space-time may remain for the layman an a-symmetric union of four dimensions in which time is not related to the others in a way in any degree similar to that in which each of these is related to every other, but in a way purely its own.

It is to be noted that the relativistic conception of space-time finally admits the a-symmetrical alternative γ, though only as a possibility. Professor Eddington writes, (*S. T. & G.*, p. 163): "The Relativity theory is not concerned to deny the possibility of an absolute time, but to deny that it is concerned in any experimental knowledge yet found. Just as each limited observer has his own particular separation of space and time, so a being coextensive with the world might well have a special separation of space and time natural to him. It is the time for this being that is here dignified by the title 'absolute.'" That is to say, absolute time could be perceived under certain possible conditions of observation. Space-time is possibly a-symmetric in ultimate constitution. Absolute time possibly exists, though it is in only a limited way discoverable by any individual observers.

It appears, accordingly, that the relativistic doctrine of space-time may be stated as follows: Absolute time exists in part, and might exist wholly, were there a universal observer. Otherwise, space-time is divided into three zones: an absolute past, an absolute future, and an intermediate zone of only relative time. There is no universal NOW to science, though there might be one, were there omniscience; but there is an absolute THEN even to science.

As already repeated, the arguments for this doctrine present, to the layman who writes, insuperable difficulties. Uncertainty as to the validity of relativistic space-time has wide consequences to

the enquirer into the theory. All the ingenious fancies which appear to be logically connected with the conception will take on for him an unsubstantial aspect. He will listen in an agnostic frame of mind to accounts of a message that passes those it meets and those it overtakes at the same rate, of an aviator's watch going at half-speed, of his cigar lasting twice as long as ours (*S. T. & G.*, pp. 24f); of travellers passing each other and making opposite judgments as to the lapses of time since two events at two distant stars, in which, "In fact, both are right unless they imagine that the other must be wrong" (*A. B. C.*, p. 85); and of progress and retrogression in the universe, optimism and pessimism, as "neither true nor false," but dependent on "the choice of clocks" (*A. B. C.*, p. 225). Mr. Russell writes also (p. 225) of "one far-off divine event" in creation, which "some parts will judge" "has already happened, while others will judge that it is still in the future" or "to which some parts of the creation move, while others move away from it." But this poetical emendation appears to identify "the private perceptions of separate observers" with "what really occurs in the physical world" (*A. B. C.*, p. 25); and, if so, itself needs emending.

Of the principles of the relativity of both distance in space and separation in time, from which all these paradoxes appear inferences, Professor Eddington gives mathematical proof (*S. T. & G.*, pp. 45f). In following out the theory of the four-dimensional world, the relativistic conception of space-time emerges, and to the supposed doubting enquirer, the proof can not but suffer from the juxtaposition. Laymen rightly revere mathematics. Nevertheless, they should not revere it more than does the mathematician, who "left to himself, never 'deviates into sense'" (*S. T. & G.*, p. 190). This pungent expression conveys the truth that mathematics affirms only that one statement follows from another, but does not affirm that either has any meaning other than that implied in their logical sequence. Mathematics is ready upon occasion to be a good servant, but makes no claim to the office of master. Can it be that in this particular proof, sense has become the servant of mathematics? This is not for the layman to say, but the supposed doubting enquirer can not help asking. All the layman can say is that were any of these extraordinary fancies to become, by some miracle of applied science, facts of observation, their explanation could not be sought in a doctrine that denied what it asserted. The laws of thought are immutable, whatever the other presuppositions that demand alteration—such, for example, as the uniform and preëminent speed of light.

The situation presented by the foregoing criticism of relativistic space-time is a singular one. Physics has found the bounds of space,

its original domain, too narrow, and has been impelled to propose a radically new view of time, the more fundamental of the two forms under which the universe presents itself. A careful attempt by a layman to grasp the new view, from expositions addressed to the general reader, has ended by giving it the sorry look of an idea inconsistent with itself. If it be such, all the marvels of relativity, in so far as they are implicated with the new view of time, partake of the logical absurdity of that idea. The tree of the new knowledge is unsound at the root.

Or, has the layman who writes merely misapprehended the conception he has tried to grasp?

6. Curvature of the Physical World

This is a disheartening result, which may leave to the layman who reads, small zest for an exploration under the present guidance, of the idea of curvature in the physical world, on which, we are told, Einstein's theory of gravitation rests. Yet this theory, as all laymen remember with a feeling akin to awe, has been superbly confirmed by astronomy.

A gleam of hope enters. Of the confirmation of Einstein's prophecy regarding the apparent displacement of stars seen near the sun during an eclipse. Professor Eddington writes (*S. T. & G.*, pp. 105 and 109): "To sum up, a ray of light passing near a heavy particle will be bent, firstly, owing to the non-Euclidean character of the combination of time with space. This bending is equivalent to that due to Newtonian gravitation, and may be calculated in the ordinary way, on the assumption that light has weight like a material body. Secondly, it will be bent owing to the non-Euclidean character of space alone, and this curvature is additional to that predicted by Newton's law. If, then, we can observe the amount of curvature of a ray of light, we can make a crucial test of whether Einstein's or Newton's theory is obeyed." . . . "For a ray grazing the surface of the sun, the numerical value of this deflection is

1″.75 (Einstein's theory)
0.87 (Newton's theory."

To the surprise, delight, and wonder of the scientific world, the observations of the eclipse of May 29, 1919, recorded displacements nearly those required by the theory of Einstein, about double those required by the Newtonian theory.

May the layman gather from Professor Eddington's analysis of this truly wonderful result that Einstein's prophecy rests, not upon the non-Euclidean character of space-time, but upon that of space alone? If so, it may not be the relativistic conception of space-

time which astronomical observation validates, but the idea of the curvature of space.

The idea of the curvature of space long antedates relativity. Half a century ago, Professor Clifford rejoiced at the freedom of his fancy from "the dreary infinities of homoloidal space." But perhaps to most laymen the idea of "heteroloidal" space is as mysterious as any that relativity presents. For them, curvature is a character of something *in* space. That it should be a character *of* space is a bewildering thought.

The layman is here in face of a new type of difficulty. It does not arise from his inattention, as did perhaps his notions of absolute motion, and absolute place or space. Nor does it conceal a logical flaw, as the relativistic notions of the ether and of space-time have seemed to do. The curvature of space is an unimaginable notion, but "unimaginable" is not "unthinkable," and the layman has only to distinguish the two terms. He must differentiate sense from thought.

Some laymen may recall learning of the old geometrical puzzle out of which the idea of the curvature of space arose. For centuries one of the postulates of Euclid had been considered a blemish in his geometry. It is neither self-evident, nor is it demonstrable from self-evident truths. This is the postulate which asserts that if a straight line crossing two others makes the interior angles on one side less than two right angles the two will meet if prolonged on that side. In meeting, they complete a triangle, and the proposition resulted that the interior angles of a triangle always sum up to two right angles. It had been proposed to test the intractable postulate by measuring large triangles, when, a half century and more ago, it occurred to several geometers independently to replace it by other postulates, and to develop from the new basis, other systems of propositions about space, other geometries. In these the interior angles of a triangle vary from two right angles, and they have been called, from their origin, non-Euclidean. The new geometries proved in some respects similar to the geometry of curved surfaces. The conception that space may illustrate other postulates than that of Euclid was accordingly termed the conception of the curvature of space. For example, on the surface of a sphere the nearest approach to straight lines are great circles. If great circles are used instead of straight lines the postulate, doubtful for the latter, becomes untrue. In a triangle formed by two meridians and the equator, the interior angles may be three right angles or more. We can not indeed imagine such a thing to happen in space, but we can perfectly well conceive that it might, and geometers have since gone on developing such possibilities, the birth of thought and not of

fancy. A great circle returns upon itself. Can it be that a straight line prolonged in space returns upon itself? This is one of the propositions of non-Euclidean geometry. It is unimaginable, but not unthinkable. The assertion that point *C* is in the same direction from *B* as *B* from *A*, makes of the three a straight line. It is implied in this assertion that *C* is different from *B* and *B* from *A*: but it is not implied that *C* is different from *A*. The conception that it may not be a different point, but may be the same point is the conception that a straight line prolonged may eventually return upon itself. This is a completely unimaginable state of affairs, but no internally contradictory conception. Nothing more is needed to acclimatize in the lay mind the idea of the curvature of space—a pure construction of thought named by analogy—than that the layman should give over the attempt to imagine the unimaginable. Let him simply accept this difficult idea without seeking to enter either into its details or into the proofs upon which it is founded. The curvature of space seems now confirmed by astronomy, and in order to be at home in the idea the layman has only to silence his fancy at the demand of thought and observation.

Relativistic space-time, on the other hand, does not appear to have been accredited by the remarkable congruence between Einstein's prophecy and astronomical observation. It would seem that the layman might continue to think of space and time in essentially different wise: and might even make bold to regard relativistic space-time as an attempt at a *mariage de convenance mathématique* between space and time, and not as a match made in heaven.

7. Extent of the Physical World

Einstein himself seems to think of time and space in essentially different wise, if the layman may venture to judge from what the expositors tell of his theory of the form of the total physical world—supposing that there be such a total, that is to say, supposing that in any sense the physical world is of finite extent.

Both Professor Eddington and Mr. Russell contrast Einstein's theory with one proposed by Professor de Sitter. Mr. Russell writes (*A. B. C.*, p. 169): "The difference between them is that in Einstein's world it is only space that is queer, while in de Sitter's world time is queer too." The layman may interpret this word "queer" as meaning "curved"; for of Einstein's theory Professor Eddington writes (*S. T. & G.*, p. 161): "His world is cylindrical—curved in the three dimensions of space and straight in the time dimension"; while of de Sitter's theory Professor Eddington writes as follows (*S. T. & G.*, p. 159): "Spherical space-time, that is to say, a four-dimensional continuum of space and imaginary time, forming the

surface of a sphere in five dimensions has been investigated by Professor de Sitter. If real time is used the world is spherical in its space dimensions and open toward plus and minus infinity in its time dimensions, like a hyperboloid."

The layman may be puzzled by the use here of the terms "cylinder," "sphere," and "hyperboloid"; for these are two-dimensional terms applied to a four-dimensional continuum—in a word, used metaphorically. The meaning appears to be that in certain definite respects the two theoretic worlds of de Sitter and Einstein resemble, respectively, the various two-dimensional figures named, these respects involving in de Sitter's case an openly or occultly symmetrical treatment of time and space in building up external nature, while in Einstein's case the treatment is openly a-symmetrical. A layman still blind to the validity of the relativistic conception of space-time as presented by Professor Eddington and Mr. Russell, will accordingly remain cold to de Sitter's world. In that world, as de Sitter writes (quoted on p. 160 of *S. T. & G.*), "all the paradoxical phenomena can only happen after the end or before the beginning of eternity." To the supposed doubting layman it may appear that de Sitter has in his theory overshot the bounds of sound sense, while Einstein in his theory has stopped within them.

In regard to the extent of external nature conceived finite, professor Eddington writes as follows (*S. T. & G.*, p. 161): "In various ways crude estimates of the size of the world both on de Sitter's and Einstein's hypotheses have been made; and in both cases the radius is thought to be of the order 10^{13} times the distance of the earth from the sun. A ray of light from the sun would thus take about 1000 million years to go round the world; and after the journey the rays would converge again at the starting-point and then diverge for the next circuit. The convergent would have all the characteristics of a real sun so far as light and heat are concerned, only there would be no substantial body present. Thus, corresponding to the sun, we might see a series of ghosts occupying the positions where the sun was 1000, 2000, 3000 million years ago, if (as seems probable), the sun has been luminous so long."

A fundamental objection to Einstein's view of the finite external world is noted both by Professor Eddington and Mr. Russell. Professor Eddington writes (*S. T. & G.*, p. 162): "In the first place, absolute space and time are restored for phenomena on a cosmical scale. The ghost of a star appears on the spot where the star was a certain number of million years ago; and from the ghost to the present position of the star is a definite distance—the absolute motion of the star in the meantime." Mr. Russell adds (*A. B. C.*, p. 172): "It seems hardly worth while to go through such a vast intel-

lectual labor, if the errors we set out to correct are to reappear at the end."

The supposed layman, believing that time and space stand on a wholly different footing in the world, is quite prepared to believe (apparently with Einstein) that time may be absolute, though space is relative. Nor is it clear to the layman that in Einstein's world space becomes absolute again. The layman's conception of the curvature of space does not imply that a light ray will eventually return to the same place in space from which it started, for to him "place" has no meaning applied to space. The curvature of space means to him that conceiving a spatial experience seen to emit light to persist indefinitely, a ray therefrom will eventually rejoin that same spatial experience. He does not conceive that the ray will return to the "place" in space whence it started, since it had no "place" to return to. In a word, it seems possible to him, though apparently not to Professor Eddington and Mr. Russell, to divorce the idea of the curvature of space completely from that of "place" therein, that is to say, from absolute space.

With the statement of this difficulty, the present discussion of some of those likely to meet the layman at the threshold of an inquiry into relativity, will end. Let the results reached be reviewed in order.

The difficulties touched upon regard seven elements in the doctrine as set forth by Professor Eddington and Mr. Russell. These elements are the relativistic conceptions of (1) Motion (of translation); (2) Space; (3) Length; (4) Duration, and of (5) Space-time, or the union of Space and Time in the Physical world, and (6) the Curvature, and (7) the Extent of that world.

The seven are features fundamental in the doctrine, and to the layman its more interesting and comprehensible features.

1. *Motion is relative.* It is a change in the spatial relations of bodies. Rest is the condition of unchanged relation between them.

On the contrary, we naturally think of motion, not as a change of relation, but as an absolute character, something inherent in the thing we say "moves."

2. *Place, or space, is relative.* If place be defined as the sum of the spatial relations borne by a body to others, then without bodies, or their equivalent, that is to say, in empty space, there is no place.

We naturally think of space as a great volume in which every body has its place independently of others. Relativity teaches that it is no such great volume. No body has a place in reference to space, but only to other bodies.

3. *Length is relative.* (To an observer.)

The distance between two bodies at rest with regard to one another will be seen by an observer travelling in the direction of the bodies from one another as less than the distance seen by an observer at rest or travelling in any other direction, in regard to them.

We naturally think of the distance between two bodies at rest regarding one another as a quantity independent of the rest or motion of its observer with regard to them.

4. *Duration is relative.* (To an observer.)

The duration of a movement between two bodies at rest with regard to one another will be seen to be greater by an observer moving in any direction in regard to them than by an observer at rest.

(This principle would appear, according to the expositions, to be logically connected with the following principle of the partial relativity of time.)

We naturally think, in the same way, that the duration of such a movement would be seen to be the same by any two observers, whether in motion or at rest regarding the bodies between which it takes place.

5. *Time, like space, is relative*: though, unlike space, it is relative only within certain limits.

Corresponding to any point-event—or event occurring at a certain point in space and instant of time—there is a zone of others within which the time-relations of events do not exist in external nature, but are relative to an observer, and outside of which they exist in external nature, or are absolute. Any point-event at a greater distance from the given point-event than light can traverse in the lapse between them, lies within this zone: all others outside. Any simultaneous distant point-events are at a greater distance than light can traverse in the lapse between them, that lapse being zero. Hence all simultaneous distant events lie within the relative zone. Absolute simultaneity between distant events does not exist.

(The logic of this principle has been criticized above. To the layman who writes, the doctrine seems to issue in the self-contradictory assertion that some events successive in external nature are not successive therein.

We naturally think that there exists one universal present and one universal past. A point-event present or past to one observer is also present or past to any other, although the judgment of any one is liable to be mistaken in the matter. Simultaneity and succession are to natural apprehension fixed for all observers. Time, unlike space, is absolute throughout.

6. *Space is curved.* (This is Einstein's view. According to de Sitter's view, time is curved also.)

Geometries, analogous to the usual geometry of curved surfaces,

may be developed by substituting other postulates for one of Euclid's. The hypothetical constructions resulting are accordingly termed curved spaces.

Calculating the motions attributed to certain heavenly phenomena by the use of a mathematical analysis of extraordinary power applied to a space of this kind, Einstein has added a correction to predictions based on Newton's law of gravitation. Einstein's theory of the curvature of space has thus become an accredited result of science.

We are taught, and hence habitually think, that Newton's law of gravitation is all-sufficient to account for the motions attributed to heavenly phenomena. Moreover, most of us have no comprehension whatever of the conception termed the curvature of space.

7. *The physical world is finite in space, though infinite in time.* The spatial world could be compassed by a ray of light, without finding any end, in perhaps 1000 million years.

We naturally think that space is infinite, because we can not imagine any space without a space beyond. But we also can not imagine any region on the surface of a sphere without a region beyond; and yet the surface of a sphere is finite. Relativity bids us give up the fancy of the infinity of space, since thought and observation seem to require the surrender.

In taking leave of the doctrine of relativity, a layman should not fail to note existing divergencies and doubts on fundamental points therein among physicists themselves. One divergence has already been mentioned. To de Sitter both time and space are "curved": to Einstein space only is "curved." Thus there appears to exist an orthodoxy and a heterodoxy among relativists—the orthodoxy that of Einstein, who on this point agrees with the general belief of mankind that no instant ever recurs, the heterodoxy that of de Sitter and those who incline to his theory of the more or less symmetrical standing of time and space in the world.

Again, we learn that the negative result of the Michelson-Morley experiment of 1881, which has been accounted for by the hypothesis of the relativity of length, has not been obtained in experiments made as lately as 1925, on a method claimed to be an improvement. Mr. Russell writes (*A. B. C.*, p. 42): "the matter is still *sub judice*, but it seems highly questionable whether the results bear out the interpretation which is put upon them."

Finally, the observed phenomena of movement of rotation seem to place in doubt even the relativity of motion and of space. Professor Eddington writes (*S. T. & G.*, p. 152 f): "The great stumbling block to a philosophy which denies absolute space is the experimental

detection of absolute rotation,''—for example, by the gyro-compass. The gyro-compass is an instrument which utilizes for the correction of the compass the tendency of a rotating body to maintain its plane of rotation. We can not conceive of the earth's rotation as simply a change in its spatial relations to the heavenly bodies. ''We do not believe that if the heavenly bodies were all annihilated, it would upset the gyro-compass,'' and therefore can not believe that the behavior of that instrument is ''due to a rotation relative to any matter that we can recognize.'' . . . ''We see at once that a relativity theory of translation is on a different footing from a relativity theory of rotation.'' Professor Eddington concludes: ''The relativity of rotation is not approximately true for the data of sense, although it may possibly be true when the unknown as well as the known are included.'' With this doubtful conclusion the layman must be content, inharmonious as it is with the confident assertions that ''all motion is relative'' and ''space is relative.''

The last sentence of Mr. Russell's book runs thus: ''The final conclusion is that we know very little, and yet it is astonishing that we know so much, and still more astonishing that so little knowledge can give us so much power.''

The layman, remembering that Marconi, Edison, and one of the Wrights still survive, shares this greater astonishment in full measure. But do we know so much? At the invitation of Professor Eddington and Mr. Russell, the layman may be ready to believe that ''the ideas involved in Einstein's work'' will one day be ''taught in the schools'' (*A. B. C.*, p. 220) and his ''amazing revelations'' one day have ''sunk into the commonplaces of educated thought'' (*Romanes lecture,* p. 32). But will these ideas and revelations survive and spread in the form in which they are currently set forth? Certainly, the paraphrase just attempted of seven items in the doctrine of relativity, as now presented to the general reader, is simple enough for the lay mind of the future. But there are divergencies and doubts among physicists that concern most of these items; and, to the layman who writes, the chief among them—the conception of space-time—presents insuperable difficulties, philosophical and logical. If these difficulties, whether illusory or real, are not inherent in the doctrine, they show how far a general reader of the present may be, even after serious effort, from understanding what relativity means. If they are inherent therein, they show how far he may be from accepting its presuppositions and its conclusions.

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IF WE HAVE LIFE, DO WE NEED PHILOSOPHY?

IN a masterly article which appeared four years ago in this JOURNAL, Dr. Robinson pointed out that there are four chief types of motivation to philosophical reflection.[1] It seems well to bring forward again in the pages of the JOURNAL the question of why men philosophize, since Herr Doktor Alexander Herzberg has, in a recent book, considered the question from the standpoint of a psychoanalyst and has advanced the thesis that Wagner's well-known statement with regard to art may be applied to philosophy. It would be rendered thus: "Hätten wir das Leben, wir keine Philosophie nötig hätten."[2] Herzberg regards philosophy as an *Ersatz,* a *Surrogat für Handeln.* Starting with such a conception, he examines the lives of thirty philosophers from Socrates to Nietzsche and draws the conclusion that the great thinker who has devoted himself to philosophy has done so because he was hampered in practical life, because he was unable to satisfy certain *Triebe* by activity. Through philosophizing, he finds an outlet for his *Triebe.* And it is well that he does find a way of expressing himself, for he is thus prevented from becoming a neurotic. Philosophy, consequently, has biological value. Moreover, in philosophizing, the thinker builds, in his imagination, a beautiful, friendly world which is an easy one for him to dominate, a world that does not injure and repel him. Thus philosophizing has mental hygienic value for the thinker.

The kind of questions about which he ponders are determined by the very fact that the great philosopher is a *gehemmter Mensch.* That is, he thinks about God because he needs divine help constantly. The active man needs God only when his own strength is insufficient. *Der gehemmte Mensch* yearns for immortality because this earthly life of his is so unsatisfactory. Since his activity is checked here, he wants freedom of the will and he erroneously supposes this freedom to mean freedom from *Zwang* and *Hemmung*—what Ritchie calls negative freedom. The thinker's motives and aims form another problem because he fails so frequently. Finally, the question of the meaning of life is a significant one for him because his own life is so unsatisfactory.[3] In short, philosophical wisdom is not purely intellectual, but it is conditioned by the unsatisfactoriness of the thinker's life. Philosophy, like art, has, thus, as its *raison d'être* the building of some other world in which the mind may dwell when reality is too unsatisfactory. Herzberg goes so far as to quote Plato to show that a man turns from the pursuit of politics or wealth

[1] "The Chief Types of Motivation to Philosophical Reflection," this JOURNAL, Vol. XX (1923), pp. 29–41.

[2] *Zur Psychologie der Philosophie und der Philosophen.*

[3] *Cf. op. cit.,* p. 231.

or fame only because of some hindrance, such as an illness or an inner, warning voice.[4] The normal man does not pursue philosophy.

With this brief summary of Herzberg's theory before us, we may well consider the actual facts with regard to motivation to philosophic reflection. As Dr. Robinson pointed out in the article to which we have already referred, there is the sociologic type of motivation. That is, men have turned to philosophy in the hope of gaining knowledge to improve our existence. To do this, however, the great thinkers have not sought to build an imaginary world and in that to live secure from life's difficulties. What Comte, for example, wanted to do was to work out a sound philosophical basis for his political theory. The France of his early life was in a very unstable state. Many constitutions were suggested, but they did not go to the root of the matter. They were simply plasters, as it were, applied to the difficulty. Comte believed that, since ideas govern the world or throw it into chaos, one must evolve a sound philosophy before he can suggest a social program that shall have any real value. Comte's aim, then, was not to evolve a visionary world to supplant the real world in men's musings, but to acquire as much knowledge about reality as possible and then to put into operation the results of such an investigation. We might name others whose motivation to philosophic study was sociologic. We would always find that their aim was not one with the day dreamer, if one may speak of the day dreamer as having an aim, but they were interested in gaining as much knowledge of the truth as possible and in working out a social program in accordance with that insight.

As for the scientific type of motivation to philosophic contemplation—"the disinterested desire to know what the world is," the type of motivation recognized by many of the great thinkers, the type which seems to Dr. Robinson to be the type of motivation *par excellence*—Herr Herzberg is quite unaware of the existence of such a type, apparently. Yet great philosophers like Plato and Aristotle and their followers to the present day have recognized the fact that the normal life of man is the intellectual life, that a life without reflection is not a life worth living. True, he who has caught the vision of the good must descend into the cave again and help mankind there, according to Plato, but the active, political life is not the most significant, normal one for man. Only that life spent in philo-

[4] It will be at once recognized that this passage from Plato's *Republic* does not at all represent Plato's view as to the motivation to philosophic reflection. Plato, who believed that the intellectual life is the natural, normal life for man, did, however, find that the philosophers of his own day had fallen into disrepute because of the Sophists. As a result, few worthy men pursued philosophy. Plato did state the fact that Theages, because of illness, and Socrates, because of an inner voice, devoted themselves to philosophy. (*Cf. Republic*, § 496.)

sophic contemplation after one has served for a time his fellows is the normal and best life for man. This realization of man's chief function and chief good is something not at all understood by Herr Herzberg, who regards such a life as only a substitute for real life, a substitute that one seeks because he is a *gehemmter Mensch*.

Rather than entertain such a view as Herzberg, one might easily support the thesis that the *gehemmter Mensch* is the practical man, that the man who is condemned to earn his food by the sweat of his brow is the one who is merely dazzled by the vision of the good and has not the mentality to grasp its significance, but is easily led astray—in some cases by "the woman thou gavest me." There are thoughts "hardly to be packed into a narrow act." These, however, the practical man never has. The life of the practical man is an *Ersatz*. Such might be our contention.

Furthermore, what we need to emphasize at the present time, rather than the idleness of thinking, is the need for more consistent thinking, the need of "seeing life steadily and seeing it whole." Much of the pain and sorrow in the world is due to the very fact that we can not attain to the synoptic view and see things, consequently, in their right relation. We need to understand *life* and *reality* as well as we can. But their significance is not given, is not attainable by a *prima facie* glance. It does not lie on the surface of things so that he who runs may read. Indeed, as Mr. Dewey has stated, we need a theory even about walking, a fact that one recognizes after he has had a long illness during which he did not walk. How much more do we need a theory about *life* and *reality* that shall penetrate into and grasp, as well as the human mind can, the nature and meaning of life and reality. There are, of course, those who are too ready to assume that the significance of life is easy to grasp and that the sordid in life is all there is to life. But there will always be clear-visioned ones to correct the narrow standpoint of the cynics. The true philosopher makes the attempt to get as close to the heart of the real as possible. Even the artist, if we may accept the testimony of a man as great in his own field as Wagner was in music, attempts to penetrate to the real significance. According to M. Rodin, the artist does not turn to art because life is unsatisfactory. M. Rodin says that the true mission of the artist is to reveal things as they are. People do not see things thus and need to be aided by the artist's representation. Such is also the mission of the philosopher: to aid mankind in understanding the world.

Moreover, we can not answer so glibly as does Herr Herzberg the question as to why people meditate on God, freedom, and immortality, and on the significance of life. It must be remembered that philosophers have found in recent days many other problems about

which to busy themselves. We must look elsewhere than to a condition of mind that borders on the neurotic for an entirely normal desire to know about the great realities of life.

May we not reiterate, then, that the true philosopher realizes that one must seek long to acquire some glimpse of reality, a quest that is the normal one for all mankind? Heraclitus was, in a sense, correct in thinking of reality as hidden by a hundred veils. The life of reflection is truly the most significant life. In order to have *life*, we need philosophy.

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BOOK REVIEWS

Statement and Inference. JOHN COOK WILSON. Edited with memoir and letters by A. S. L. Farquharson. Oxford: The Clarendon Press. New York: Oxford University Press, American Branch. 1926. 2 vols. Pp. clxiv + 901.

Cook Wilson's influence in a certain quarter was so great, while his name is so little known in this country, that in noticing here his only published work of any magnitude a few words may be permitted regarding the man himself.

From 1889 to his death in 1915, Wilson was Wykeham Professor of Logic at Oxford. He had had an extraordinarily brilliant undergraduate career, taking "moderations" and the final honor schools in both classics and mathematics and gaining four first classes in four successive years. In 1874 he was elected a fellow of Oriel from a field which included A. C. Bradley, then known as a rising philosopher rather than as a literary critic. So keen did his interest remain in classical and mathematical scholarship that much of his later time and most of what he published were taken up with the interpretation or the textual criticism of Plato and Aristotle and with controversies, vigorously waged, on these or on mathematical points. Indeed, his philosophic writing suffered greatly from too persistently diffused attention. Lacking the power possessed by his teacher Lotze, for example, of making his scattered studies contribute to a philosophic system developed through their means, he worked by concentrating with desperate intensity on one isolated point after another. As a result he left no system, logical or other. Nevertheless, his pupil, Mr. Joseph, writing shortly after his death, could say that "for many years he had been by far the most influential philosophical teacher at Oxford." How is this to be explained? A remark of Mr. Joseph's perhaps suggests the answer: "at all times and in all matters he was incapable of doing things by halves." It is

to be doubted if there is any English-writing logician who has handled the problems he attempted with such merciless thoroughness. No cost of time or energy could deter him from finishing a problem; he turned it inside out and tore it to tiny pieces, so that when he had finally done with it, his student, at once exhausted and exhilarated, felt that here, if anywhere, the truth was to be found.

This unsparing thoroughness was the leading characteristic of Wilson's mind. But he was, apart from this, a most striking personality. Physically quite small, with a sage's beard turned prematurely white, he was at the same time markedly athletic, and for many years after attaining his professorship, captained a military cyclist corps with efficiency and dash. His strongly combative spirit involved him in numerous controversies. Perhaps the most interesting of these were a debate with Archer-Hind over the latter's edition of the *Timaeus*, ending with an annihilating pamphlet by Wilson of no less than 149 pages, and a debate with Lewis Carroll on certain points in mathematical logic, in which the redoubtable author of *Alice* seems on the whole to have scored a victory. But, delighting as he did in battle, Wilson was also the kindest and most affectionate of men. Adam's edition of the *Republic* and Bosanquet's translation of Lotze bear typical witness in their introductions to the way he lavished assistance on those who asked it; and Mr. Farquharson's introductory memoir is a very attractive portrait, not merely of a passion for truth and its clear and precise expression, but also of domestic devotion through great trial and an almost childlike simplicity of moral nature.

Wilson's passion for the exact truth shows through all these logical writings. However strongly he feels the importance of an issue, he is never seduced into being rhetorical; his thought is often extremely technical, but he remains true to his conviction that it can be put in simple terms. He was, unfortunately, somewhat lacking in a sense for literary form, so that although in logical acumen his work perhaps equals Bradley's, it is too dry and slow of movement to approach this in breadth of appeal. The present work has the further disadvantage of having never had his final revision, for like some other distinguished Oxford dons, his standards were so high that no form in which he cast his thought could satisfy later inspection, and the revision was finally left to other hands. Again, his predilection for mathematics led him to choose from this field nearly all of his illustrations, and in most of his other examples to use merely symbolic letters, thus purchasing exactness at the price of a certain aridity. Nevertheless, his writing is straightforward, unpedantic, and, so far as he could make it, untechnical; and if it is a dry light that is thrown on his subjects, it is at least always light.

The two volumes on *Statement and Inference* are divided into three main sections. There is first a memoir, followed by some eighty pages of letters; then the main body of the work, compiled from the lecture manuscripts of many years, which occupies 663 pages and covers with varying completeness all the principal headings of logic; finally, a series of papers, and extracts from philosophical letters, chiefly also on logical topics. The work is excellently printed and painstakingly edited, with numerous footnotes by author and editor, and with an adequate index. Confronted by so great a mass of matter, the reviewer can scarcely do more than select for very brief mention some of the more distinctive of Wilson's views.

It will be observed that in the title of the work, "Statement and Inference," the term "statement" takes the place of the more usual "judgment." This suggests in itself a distinctive view of the author. He noted that the term "judgment" had been commonly applied to every mental attitude which could be expressed by "*S* is *P*." But he discovered that though these attitudes all found expression through an identical verbal statement, they were extremely different among themselves and that judgment was only one of them. Accordingly, he set himself in several introductory lectures to analyze and distinguish the various meanings of "*S* is *P*." He notes four principal kinds of thinking that may be expressed in it. First, there is mere opinion, which is less than the knowledge that *S* is *P*, but which involves knowledge, nevertheless, since it is based on our knowing that there is at least some evidence in favor of the statement's truth (99). Then there is belief, which is different from opinion partly in a more favorable estimate of the evidence, partly in a greater feeling of confidence that this estimate is sound (102). Then, again, there is judgment, in the proper sense of the word, a decision which is wholly certain because seen to follow from evidence, that *S* is and must be *P* (92, 108). Finally, there is knowledge, of which judgment is already an example, but which is found also where judgment is absent, for instance, in cases of mere perception. From these analyses there follow some interesting results. For one thing, judgment, as here defined, becomes really indistinguishable from inference. For another thing, it becomes incapable of falsity, for it is a form of knowledge, and knowledge, if it is false, is not knowledge at all.

This gives rise at once to a question which is for logic of ultimate importance, and Wilson does not evade it. How are we to know when we know? He has explained that what unifies the types of thought which logic studies is that all of them aim at knowledge; what, now, is the criterion by which we shall know when the end is attained? Wilson's reply is unambiguous: there is no general

criterion at all; knowledge is its own sole witness; "the consciousness that the knowing process is a knowing process must be contained within the knowing process itself" (107). But now comes the point of real difficulty. Is not this consciousness sometimes in error, and if so, is it not generally unreliable, and if it is that, must not logic end in skepticism? That we do sometimes possess about propositions which are false the same simple and absolute certainty that we feel about propositions which are true seems to be undeniable fact, and if so, may not certainty be everywhere an illusion of our own? Wilson answers with an elaborate analysis of this deceptive "certainty," and concludes that the truth about such cases is not that we have thought wrongly, but that we have not thought at all. Thought, the kind of thought that is at work in judgment and inference, never errs, because it merely follows the track of objective necessity; and if we find ourselves derailed into fallacy, that is not because of anything so meaningless as that the track itself led into a culvert, but because, without being aware of it, we ceased to follow the argument whither it led.

When he arrives at the analysis of statement into logical subject and predicate, Wilson gives it a novel turn. The ordinary line of distinction, he reminds us, is the line between that which is spoken of and that which is said about it. And these things have usually been discovered by simple reference to the grammatical subject and predicate. But it is really quite impossible to tell from these which is which. What is the logical subject of "glass is elastic"? That depends, Wilson replies, on the question it is designed to answer, and often the only indication is the relative stress placed upon the words in utterance. If, with glass in mind, I am seeking to enumerate its properties, glass is the subject; if, with elasticity in mind, I am seeking to enumerate the things that possess this property, elasticity is the subject. Putting it generally, "the subject is what we were thinking of, as we thought it or conceived it, before forming the judgment . . . while the predicate is the new fact, or what we suppose to be the new fact, which we come to know about it" (118). And these are more certainly discerned by mere vocal stress than they are by grammatical rule.

But supposing now that we have distinguished the logical subject, can we identify this with the metaphysical subject? Bradley, of course, maintained that we can not, that in the final reckoning the subject of every judgment is not that of which we are thinking immediately, but the absolute reality. Wilson's criticism of this view is that "the doctrine and the importance attached to it depend on a mere confusion of analysis, and that instead of being a bit of new metaphysics, it is only an ancient fallacy in a modern dress"

(167). In the present writer's opinion, this stricture is not made good. Bradley's intention would appear to be this: that we mean in every judgment to assert that something holds of the real world; that the point in this real world of which we assert our meaning is never immediately the whole, but some limited area within it which we call the logical subject; that in the character in which it first comes to us, this subject is proved by reflection to be unreal, since it is but a fragment in a system and its nature can not be grasped till its part in the system is known; that therefore, since we mean our judgment to hold of the real world, our thought in its secret aim shoots beyond its visible mark and commits itself implicitly to a program which would mean transforming all intermediate goals. Wilson admits that since everything falls obviously enough within the self-existent whole, that may be said to be the ultimate subject, but he appears to consider that this is of no interest to logic. But if one holds, as Wilson does, that the thought which logic studies has as its aim to know reality, and holds further, as Bradley does, that such knowledge would leave no logical subjects standing short of the absolute, it is difficult to see why this should not be of the very greatest interest to logic. For it is nothing more or less than the attempt to make plain the implicit end of all thinking, what all thought "means to mean."

Many other of the most valuable discussions of the book bear directly on metaphysical problems. Wilson's own philosophical position seems at first to have been an idealism of the type of Green's, but he gradually worked himself free from this into a realism of his own. In a chapter of the present work on logic and the theory of knowledge, he follows an acute criticism of Locke's copy theory of truth with a still more searching criticism of the view which would reduce the object of knowledge to the process of apprehending it (66–76). Again, there is to be found among his philosophical letters a most elaborate discussion of our knowledge of the primary and secondary qualities (764–800), in which he argues that we have a direct apprehension of a physical world conceived much as Newton conceived it. In accordance with the Oxford custom of introducing freely into lectures on logic matter that is more commonly described as the theory of knowledge, Wilson gave much attention to the school of English empiricists, and his exposure of Locke's confusions regarding simple and complex ideas (498–511), his enumeration of the ideas that can not be derived from sensation (513–18), and his proof that complex ideas can not be arbitrarily made (521–4), have a more than logical value. Among many other such discussions, the treatment in his inaugural lecture of the empirical derivation of axioms, defended in its most plausible form by Herbert Spencer,

is peculiarly brilliant and conclusive. To say, as Spencer does, that the test of truth is our inability, developed by experience, to conceive a contradictory, is, says Wilson, to move in a circle. You first show that the criterion rests on experience, and then to show that the experience is such as must have produced the criterion, you use the criterion itself. For the wealth of argument which, being of a less dialectical type, can not be so briefly stated, there is unhappily here no space.

Nor is there room for a listing of Wilson's technical logical doctrines. In his case this is perhaps the less to be deplored because the value of his treatment lies so largely in the process of discussion itself. But there are two general tendencies of his work which can not be passed over. One is the tendency to fall back continually for light in logical difficulties on the analysis of the meanings of common speech. "A philosophical distinction is *prima facie* more likely to be wrong than what is called a popular distinction," he said, "because it is based on a philosophic theory which may be wrong in its ultimate principles" (874). The result is that in the present work there is a great amount of discussion (too much, many readers would say) of the meaning of grammatical forms. The second prepossession is that in favor of mathematics as providing, not merely examples of logical points, but truth, objective and ultimate. Acknowledging a great debt to Kant, he yet parted from him decisively over what he considered a tendency in Kant to make mathematical necessity subjective. And he objected very vigorously to that modern mathematical teaching which reduces axioms to postulates, regards postulates as arbitrary, and deals, with the readiest confidence, in many-dimensional spaces. It is greatly to be regretted that he did not live to complete a more thorough study of recent mathematical logic and to order his ideas upon it, for he is one of its few philosophical opponents who could bring to the support of his criticism an adequate mathematical training.

These two volumes should not be read straight through; their treatment is too unsystematic, unequal, and diffuse. But on many special points they supply the finest discussions in the language. The lectures were written to be spoken, not to be read, and those who knew Wilson say that it is hard for the mere reader to see what it was that made him the most stimulating philosophic influence that Oxford has known since Green. Still, even his readers can surmise. It was the vise-like grip of his mind which refused to let go of a problem till it had surrendered unconditionally. He was "one of the few," says his pupil, Mr. Prichard, "who are capable of doing that rare kind of work which is done once for all."

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Kant's Philosophy of Religion. CLEMENT C. J. WEBB. Oxford: Clarendon Press. New York: Oxford University Press, American Branch. 1926. 218 pp.

Professor Webb of Oxford has produced an important book for all readers who are interested in the modern interpretation of religion as well as for all who are interested in the development of Kant's philosophy. The book begins with a brief but adequate review of Kant's early religious development and the influences which shaped his religious faith, followed by an excellent study of his point of view during his precritical period.

The central feature of Webb's study of the critical period is the primacy of the moral will in man and the light it throws upon the essential aspect of religion. Webb holds that in his account of our moral experience Kant is *in the main matter* absolutely right and that, while the postulate of God as formulated "produces no conviction," the primacy of Practical Reason carries us "farther into the heart of reality than the purely speculative or scientific reason could ever take us." There is a brief but valuable treatment of the "Ideas" in the Dialectic, and the tendency toward a view of divine immanence in the *Critique of Judgment.*

But quite naturally the most important part of the book is the long section on "Religion within the Limits of mere Reason." It reveals the unhistorical character of Kant's mind and it shows how far he was himself from seeing the deeper implications and the revolutionary character of his own critical conclusions. There is nothing epoch-making to be found in this cautious, somewhat penurious treatise. "It lacks unction and kindling power, but its dry and sober steps, devoid of all enthusiasm and *Schwärmerei,* drive home very forcibly the position that *there is no getting away from God* if one once admits the fact of moral obligation—God is only apprehensible by us in and through our moral obedience to the law which we know by its own manifest authority to be the expression of His will." Kant's conclusion is that "the Practical Reason is in the last resort God's sole authentic communication to man."

The freshest part of the book and the part which puts Kant in new light is the chapter on Kant's *Opus Postumum.* This treatise, written between 1800 and 1803, reveals a strong transition in Kant toward the conception of God as *immanent.* "There is," Kant says in this treatise, "A Being in me, distinguished from myself as a cause of an effect wrought upon me, which freely judges me within, justifying or condemning me"; "God is no substance discoverable outside of me, but a moral relation within me."

Professor Webb's book is a sound, solid, well-balanced piece of work. It brings to light the severe limits within which religion

moves for Kant, but it also opens out the significance of Kant's attempt to find a rational ground and basis for religion. The strength and weakness of Kant's treatment are well discussed in the Conclusion.

RUFUS M. JONES.

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JOURNALS AND NEW BOOKS

JOURNAL DE PSYCHOLOGIE. XXIV^e^ Année, No. 4. L'aphasie selon Henry Head: *H. Delacroix.* Sur la psychologie comparée de l'artiste, de l'amateur et du public: *Ch. Lalo.* Sur l'autonomie fonctionnelle émotive: *V. Benussi.* Réponse à M. Benussi: *H. Wallon.* Rectification à la réponse de M. H. Wallon: *V. Benussi.* Dernière mise au point: *H. Wallon.* Méthode de mise au point et d'étalonnage d'un test d'aptitude professionnelle: le test du tourneur: *J.-M. Lahy.* Essai d'étalonnage de deux texts d'imagination et d'observation: *J. Abramson.* Le VIII Congrès international de Psychologie: *P. Janet.* XXXI^e^ Congrès des Aliénistes et Neurologistes.

REVUE D'HISTOIRE DE LA PHILOSOPHIE. 1^re^ Année, Fasc. 3. Les objections des orientaux contre critique historique: *P. Masson-Oursel.* Revue critique de quelques ouvrages récents relatifs à la philosophie de Malebranche: *R. Hubert.* Le Mesmérisme et le système du monde: *R. Lenoir.* Remarques sur la philosophie de l'histoire de Hegel: *H. Sée.*

Aster, E. von: Geschichte der englischen Philosophie. (Die Handbibliothek des Philologen. Sammlung wissenschaftlicher Handbücher für das Studium der alten und neuren sprachen.) Bielefeld und Leipzig: Belhagen & Klasing. 1927. 215 pp.

Robinson, Daniel Sommer: Illustrations of the Methods of Reasoning. A Source Book in Logic and Scientific Method, with Numerous Illustrations from Various Sciences. New York: D. Appleton & Company. 1927. xiii + 346 pp. $2.00.

NOTES AND NEWS

A preliminary announcement of the 1927 meeting of the American Philosophical Association states that the three divisions, the Eastern Division, the Western Division, and the Pacific Division, will meet together in Chicago late in December. The University of Chicago and Northwestern University will act as hosts. At this time the second series of Carus lectures will be presented.

THE JOURNAL OF PHILOSOPHY

There is no similar journal in the field of scientific philosophy. It is issued fortnightly and permits the quick publication of short contributions, prompt reviews, and timely discussions. The contents of the last six issues are as follows:

Volume XXIV. No. 13. June 23, 1927.

Rignano's Hypothesis of a Vital Energy and the Prerequisites of a Sound Theory of Life. F. S. C. NORTHROP.

Book Reviews. Journals and New Books. Notes and News.

Volume XXIV. No. 14. July 7, 1927.

The Milesian Background of our Scientific Ontology. HAROLD CHAPMAN BROWN.

A Phenomenological Interpretation of Physico-Chemical Configurations and Conscious Structures (I). OLIVER L. REISER.

Book Reviews. Journals and New Books. Notes and News.

Volume XXIV. No. 15. July 21, 1927.

The Rôle of Dogma in Philosophy. W. H. SHELDON.

A Phenomenological Interpretation of Physico-Chemical Configurations and Conscious Structures (II). OLIVER L. REISER.

Book Reviews. Journals and New Books. Notes and News.

Volume XXIV. No. 16. August 4, 1927.

The Irrationality of *the Irrational.* SIDNEY HOOK.

William James and the Will to Believe. F. C. S. SCHILLER.

Book Reviews. Journals and New Books. Notes and News.

Volume XXIV. No. 17. August 18, 1927.

An Empirical Account of Appearance. JOHN DEWEY.

Moral Freedom. M. R. GABBERT.

Book Reviews. Journals and New Books. Notes and News.

Volume XXIV. No. 18. September 1, 1927.

Relativity and the Lay Mind (I). BENJAMIN IVES GILMAN.

The Datum as Essence. GEORGE BOAS.

Book Reviews. Journals and New Books. Notes and News.

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American Journal of Psychology.—Ithaca, N. Y.; Cornell University.
Subscription $6.50. 624 pages annually. Edited by E. B. Titchener.
Quarterly. General and experimental psychology. Founded 1887.

Pedagogical Seminary and Journal of Genetic Psychology.—Worcester, Mass.; Clark University.
Subscription $7.00. 700 pages annually. Edited by Carl Murchison and international co-operating board. [1891.
Quarterly. Child behavior, differential and genetic psychology. Founded

Genetic Psychology Monographs—Worcester, Mass.: Clark University.
Subscription $7.00. 600 pages annually. Edited by Carl Murchison and an international coöperating board.
Bi-monthly from January 1926. Each number one complete research. Child behavior, differential and genetic psychology. Founded 1925.

Psychological Review.—Princeton, N. J.; Psychological Review Company.
Subscription $5.00. 480 pages annually.
Bi-monthly. General. Founded 1894. Edited by Howard C. Warren and John B. Watson.

Psychological Bulletin.—Princeton, N. J.; Psychological Review Company.
Subscription $5.50. 720 pages annually. Psychological literature.
Monthly. Founded 1904. Edited by Samuel W. Fernberger.

Psychological Monographs.—Princeton, N. J.; Psychological Review Company.
Subscription $6.00 per volume. 500 pages. Founded 1895. Edited by Shepherd I. Franz.
Published without fixed dates, each issue one or more researches.

Psychological Index.—Princeton, N. J.; Psychological Review Company.
Subscription $2.00. 200 pages. Founded 1895. Edited by W. S. Hunter.
An annual bibliography of pyschology literature.

Archives of Psychology.—Sub-Station 84, New York; Archives of Psychology.
Subscription $5.00. 500 pages per volume. Founded 1906. Edited by R. S. Woodworth.
Published without fixed dates, each number a single experimental study.

Journal of Abnormal Psychology and Social Psychology.—Albany, N. Y.
Subscription $5.00. Boyd Printing and Publishing Co. Edited by Morton Prince in co-operation with Floyd H. Allport.
Quarterly. 432 pages annually. Founded 1906. Abnormal and social.

Psychological Clinic.—Philadelphia; Psychological Clinic Press. [1907.
Subscription $2.50. 288 pages. Edited by Lightner Witmer. Founded
Without fixed dates (9 numbers). Orthogenics, psychology, hygiene.

Training School Bulletin.—Vineland, N. J.; The Training School.
Subscription $1.00. 160 pages annually. Edited by E. R. Johnstone. Founded 1904.
Monthly (10 numbers). Psychology and training of defectives.

Comparative Psychology Monographs.—Baltimore; Williams & Wilkins Co.
Subscription $5.00. 500 pages per volume. Edited by W. S. Hunter.
Published without fixed dates, each number a single research.

Psychoanalytic Review.—Washington, D. C.; 3617 Tenth Street, N. W.
Subscription $6.00. 500 pages annually. Psychoanalysis.
Quarterly. Founded 1913. Edited by W. A. White and S. E. Jelliffe.

Journal of Experimental Psychology.—Princeton, N. J.
Psychological Review Company. 480 pages annually. Experimental.
Subscription $5.00. Founded 1916. Bi-monthly. Edited by Madison Bentley.

Journal of Applied Psychology.—Worcester, Mass.; Florence Chandler.
Subscription $5.00. 400 pages annually. Founded 1917.
Quarterly. Edited by James P. Porter and William F. Book.

Journal of Comparative Psychology.—Baltimore; Williams & Wilkins Co.
Subscription $5.00. 500 pages annually. Founded 1921.
Bi-monthly. Edited by Knight Dunlap and Robert M. Yerkes. J.P.

Psychological Abstracts.—Princeton, N. J.
Subscription $6.00. 600 pages annually. Edited by W. S. Hunter.
Monthly. Abstracts of psychological literature. Founded 1927.